REMARKS

By the foregoing Amendment, Claims 1 and 12 are amended and additional Claim 21 is presented. Entry of the Amendment, and favorable consideration thereof is earnestly requested.

The Examiner has indicated that Claim 6 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Claim 6 has been so rewritten as newly added Claim 21.

The Examiner has rejected Claims 1-5 and 7-20 either under 35 U.S.C. §102(b) as being anticipated by, or under 35 U.S.C. 103(a) as being unpatentable over, Tsukamoto (U.S. Patent No. 6,231,133) and/or Prinzler et al. (U.S. Patent No. 5,810,454). Applicant respectfully asks the Examiner to reconsider these rejections in view of the above Amendments and the below Remarks.

The present invention is directed to a control scheme for a braking system which is particularly adapted to provide system redundancy, while at the same time reducing the likelihood of complete system failure in the case of catastrophic failure (such as caused by an exploding tire, a fire or the like) of one of the system components being controlled. This has been a problem with known prior art systems, which generally operate in one of two ways.

Amendments to the Drawings:

No amendments are made to the Drawings herein.

In the first type of known prior art system, multiple controllers are provided, each of which controls some of the brake system components, but not others. Thus, for example, a system may include two controllers, each providing control signals to half of the brake system components. Thus, in the case of failure of one controller, half of the system components would still be controlled.

In the second type of known prior art system, multiple controllers are provided, each of which provides control signals to all system components on a full time basis (i.e., true redundancy). While this may appear desirable in that should one of the controllers fail, all of the system components would be receiving control signals from the other controller, in practice, this type of system suffers from at least one significant drawback. Specifically, in the event of a catastrophic failure in one of the system components controlled by both controllers (such as caused by an exploding tire, a fire or the like), <u>both</u> control networks may be shorted out, thus causing <u>both</u> control networks to fail resulting in a complete loss of control of all system components.

The present invention remedies the deficiencies of both types of prior art systems. In the present invention, first and second control networks electrically connect one or more controllers with first and second brake components,

respectively. An auxiliary control link is activatable to electrically connect the first brake component and the second brake component only when a failure occurs in one of the first control network or the second control network, the auxiliary control link being adapted to transmit the control signals between the first brake component and the second brake component only when the failure occurs. Such an arrangement provides redundancy in that should the first controller fail, the first brake component would be provided control signals through the auxiliary control link from the second brake component. Moreover, the system is not prone to complete failure, in that should the first brake component suffer from a catastrophic failure, the first control network may be shorted out -- the second control network being safe since the first brake component was not directly connected to the second control network when it suffered catastrophic failure. Thus, other brake components which have been controlled by the first control network (now shorted out) may be supplied control signals by the other half of the "pair" to which they belong through auxiliary control links, thereby rendering only a single brake component (i.e., the one which suffered from a catastrophic failure anyway) without control signals.

Claims 1 and 12, the two independent claims, have been amended to further highlight the novelty of the present invention, and require, among other elements, that each auxiliary control link is activatable to electrically connect the

first brake component of each pair of brake components and the second brake component of each pair of brake components only when a failure occurs in one of the first control network or the second control network and that each auxiliary control link be adapted to transmit the control signals between the first brake component of each pair of brake components and the second brake component of each pair of brake components only when the failure occurs.

Applicant respectfully submits that neither Tsukamoto nor Prinzler et al. discloses, teaches or suggests the above-highlighted elements.

Tsukamoto discloses a vehicle brake controller which detects faults within the system and then applies a modified control algorithm if such a fault is detected. However, there is no disclosure, teaching or suggestion either that (i) each auxiliary control link is activatable only when a failure occurs, or (ii) that each auxiliary control link be adapted to transmit the control signals between the first brake component and the second brake component of each pair of brake components only when the failure occurs. First, the communications link cited by the Examiner as being equivalent to the required "auxiliary control link" (i.e., the link between brake pressure controllers 10F and 10R in Figure 19) does not transmit the control signals. Rather, the communications link pointed to by the Examiner is used to transmit a "no fault" signal indicating that no system fault has

been detected. Moreover, even if this "no fault" signal could be interpreted as a control signal, the communications link in question is not activatable only when a fault is detected. In fact, in order for the Tsukamoto system to operate as disclosed the communications link in question must operate in just the opposite fashion. More specifically, Tsukamoto discloses that each brake pressure controller 10F, 10R expects to receive a "no fault" signal from the other brake pressure controller 10F, 10R at all times unless a fault is detected. See Column 18, lines 46-54:

> When the brake pressure controller 10F (10R) has a fault, or when energization from the battery 11F (11R) is interrupted, the process itself can no longer be executed and a fault information signal cannot be input to the other controller 10R (10F).
>
> Therefore by determining that a fault has occurred unless a signal to the contrary is input in the step S402, a fault can be detected in the other controller, not only in the actuator but also in the controller or battery.

(emphasis added). It would make no sense to activate the communications link only when a fault existed (as required by the claims) only to then not provide a "no fault" signal to indicate that a fault has occurred.

Prinzler et al. discloses a system which operates as described above in connection with the second, "true redundancy", technique. More specifically, Prinzler discloses a brake actuating device 6 which inputs signals to four processors (8a, 8b; 10a, 10b) which drive brake system actuators (12a to 12d). Two of the processors (8a, 8b) assume additional "higher functions" (14a, 14b) of

the overall vehicle control, such as ABS reference speed formation, driving dynamic control, etc. These processors (8a, 8b) are operatively connected to each other via line 20 for the purpose of mutual control. (see Column 2, lines 19-22: "For reasons of safety, these higher-ranking functions cannot be allowed to run nonredundantly. Accordingly, these higher-ranking functions must control each other and are therefore required in duplicate."; Column 4, lines 26-29: "The 'higher functions' (14a, 14b) communicate with each other via the data connection 20 for the purposes of mutual control."). Applicant respectfully submits that there is absolutely no disclosure, teaching or suggestion in Prinzler et al. that (i) each auxiliary control link is activatable only when a failure occurs, or (ii) that each auxiliary control link be adapted to transmit the control signals between the first brake component and the second brake component of each pair of brake components only when the failure occurs.

Additionally, Applicant respectfully submits that the "mutual control" taught by Prinzler et al. is precisely one of the prior art techniques upon which the present invention was intended to improve. As discussed above and in the Background section of the application as filed, such "mutual control" systems suffer from at least one significant disadvantage -- in the event of a catastrophic failure in one of the system components controlled by both controllers (such as caused by an exploding tire, a fire or the like), both control networks may be shorted out, thus

causing both control networks to fail resulting in a complete loss of control of all system components. The system described in Prinzler et al. is susceptible to just this type of total system failure of both "higher function" 14a, 14b processors 8a, 8b.

For the foregoing reasons, Applicant respectfully submits that all pending claims, namely Claims 1-21, are patentable over the references of record, and earnestly solicits allowance of the same.

Respectfully submitted,

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